

**CLAIMS**

1           1.       A method for providing automated diagnostic services for a cluster  
2 computer system comprising a plurality of nodes, each of the plurality of nodes  
3 providing an application to a plurality of clients, the method comprising the steps of:  
4           receiving a current value of a network parameter related to cluster middleware  
5 associated with the cluster computer system;  
6           analyzing the current value of the network parameter relative to a  
7 predetermined reference value for the network parameter; and  
8           providing information based on the analysis of the current value relative to the  
9 predetermined reference value.

1           2.       The method of claim 1, wherein the network parameter relates to a  
2 network heartbeat interval for a node in the cluster computer system and the  
3 predetermined reference value is an optimal network heartbeat interval for the node  
4 based on the current heartbeat link for the node.

1           3.       The method of claim 2, wherein the step of analyzing the current value  
2 of the network heartbeat interval relative to the optimal network heartbeat interval  
3 comprises determining whether the difference between the current value and the  
4 optimal network heartbeat interval is within a predetermined variance.

1           4.       The method of claim 3, wherein the step of providing information  
2       based on the analysis of the current value relative to the optimal network heartbeat  
3       interval comprises providing a warning of a potential failover recovery problem if the  
4       difference between the current value and the optimal network heartbeat interval is not  
5       within the predetermined variance.

1           5.       The method of claim 3, further comprising the step of determining  
2       whether an alternative heartbeat link for the node is available if the difference between  
3       the current value and the optimal network heartbeat interval is not within the  
4       predetermined variance.

1           6.       The method of claim 3, further comprising the step of repeating the  
2       above steps for another node in the cluster computer system if the difference between  
3       the current value and the optimal network heartbeat interval is within the  
4       predetermined variance.

1           7.       The method of claim 5, further comprising the step of providing a  
2       warning of a potential failover recovery problem if an alternative heartbeat link for the  
3       node is not available.

1           8.       The method of claim 5, further comprising the step of, if an alternative  
2 heartbeat link for the node is available, determining the optimal network heartbeat  
3 interval for the node based on the alternative heartbeat link for the node and analyzing  
4 the current value of the network heartbeat interval relative to the optimal network  
5 heartbeat interval associated with the alternative heartbeat link for the node.

1           9.       The method of claim 1, wherein the network parameter relates to a  
2 node timeout value for a node in the cluster computer system and the predetermined  
3 reference value comprises a predefined threshold range for the node timeout value.

1           10.      The method of claim 9, wherein the predefined threshold range for the  
2 node timeout value is based on a function of a network heartbeat interval for the node.

1           11.      The method of claim 10, wherein the step of analyzing the current  
2 value of the node timeout value relative to the predefined threshold range comprises  
3 determining whether the current value of the node timeout value is within a  
4 predetermined variance.

1           12.      The method of claim 11, wherein the step of providing information  
2 based on the analysis of the current value relative to the predefined threshold range for  
3 the node timeout value comprises providing a warning that the node timeout value is  
4 not within the predefined threshold range.

1           13.     The method of claim 12, wherein the step of providing information  
2     based on the analysis of the current value relative to the predefined threshold range for  
3     the node timeout value further comprises generating an instruction configured to set  
4     the node timeout value within the predefined threshold range.

1           14.     The method of claim 12, wherein the predetermined reference value  
2     further comprises a predefined recommended range and wherein the step of providing  
3     information based on the analysis of the current value relative to the predefined  
4     threshold range and the predefined recommended range further comprises, if the  
5     current value of the node timeout value is greater than the upper bound of the  
6     predefined threshold range, providing a warning that the node timeout value is too  
7     high and generating an instruction configured to set the node timeout value of the  
8     node to the upper bound of the predefined threshold range.

1           15.     The method of claim 12, wherein the predetermined reference value  
2     further comprises a predefined recommended range and wherein the step of providing  
3     information based on the analysis of the current value relative to the predefined  
4     threshold range and the predefined recommended range further comprises, if the  
5     current value of the node timeout value is greater than the upper bound of the  
6     predefined recommended range, determining whether an empirical condition  
7     associated with the cluster computer system exists that suggests the current value of  
8     the node timeout value should be greater than the upper bound of the predefined  
9     recommended range.

1           16.     The method of claim 15, further comprising the step of, if an empirical  
2     condition does not exist, providing a warning that the node timeout value is too high  
3     and generating an instruction configured to set the node timeout value of the node to  
4     the upper bound of the predefined threshold range.

1           17.     The method of claim 12, wherein the predetermined reference value  
2     further comprises a predefined recommended range and wherein the step of providing  
3     information based on the analysis of the current value relative to the predefined  
4     threshold range and the predefined recommended range further comprises, if the  
5     current value of the node timeout value is less than the lower bound of the predefined  
6     recommended range, determining whether an empirical condition associated with the  
7     cluster computer system exists that suggests the current value of the node timeout  
8     value should be less than the upper bound of the predefined recommended range.

1           18.     The method of claim 17, further comprising the step of, if an empirical  
2     condition does not exist, providing a warning that the node timeout value is too low  
3     and generating an instruction configured to set the node timeout value of the node to  
4     the lower bound of the predefined recommended range.

1           19.     The method of claim 12, wherein the predetermined reference value  
2 further comprises a predefined recommended range and wherein the step of providing  
3 information based on the analysis of the current value relative to the predefined  
4 threshold range and the predefined recommended range further comprises, if the  
5 current value of the node timeout value is not less than the lower bound of the  
6 predefined threshold range, providing a warning that the node timeout value is too low  
7 and generating an instruction configured to set the node timeout value of the node to  
8 the lower bound of the predefined threshold range.

1           20.     The method of claim 1, wherein the network parameter relates to an  
2 autostart timeout interval for a node in the cluster computer system and the  
3 predetermined reference value comprises a predefined range for the autostart timeout  
4 interval.

1           21.     The method of claim 20, wherein the step of analyzing the current  
2 value of the autostart timeout interval relative to the predefined range comprises  
3 determining whether the current value of the autostart timeout interval is within the  
4 predefined range.

1           22.     The method of claim 21, wherein the step of providing information  
2     based on the analysis of the current value relative to the predefined range for the  
3     autostart timeout interval comprises, if the current value of the autostart timeout  
4     interval is above the upper bound of the predefined range, providing an instruction  
5     configured to decrease the autostart timeout interval of the node.

1           23.     The method of claim 21, wherein the step of providing information  
2     based on the analysis of the current value relative to the predefined range for the  
3     autostart timeout interval comprises, if the current value of the autostart timeout  
4     interval is below the lower bound of the predefined range, providing an instruction  
5     configured to increase the autostart timeout interval of the node.

1           24.     The method of claim 21, wherein the step of determining whether the  
2     current value of the autostart timeout interval is within the predefined range is  
3     performed after determining that a cluster unification process has been initiated during  
4     reboot of the node.

1           25.     The method of claim 1, wherein the network parameter relates to a  
2     network polling interval for a node in the cluster computer system and the  
3     predetermined reference value comprises a predefined range for the autostart timeout  
4     interval.

1           26.     The method of claim 25, wherein the step of analyzing the current  
2 value of the network polling interval relative to the predefined range comprises  
3 determining whether the current value of the network polling interval is within the  
4 predefined range.

1           27.     The method of claim 26, wherein the step of providing information  
2 based on the analysis of the current value relative to the predefined range for the  
3 network polling interval comprises, if the current value of the network polling interval  
4 is above the upper bound of the predefined range, providing an instruction configured  
5 to decrease the network polling interval of the node.

1           28.     The method of claim 26, wherein the step of providing information  
2 based on the analysis of the current value relative to the predefined range for the  
3 network polling interval comprises, if the current value of the network polling interval  
4 is below the lower bound of the predefined range, providing an instruction configured  
5 to increase the network polling interval of the node.

1           29.     The method of claim 26, wherein the step of determining whether the  
2 current value of the network polling interval is within the predefined range is  
3 performed after determining that the network polling has been set.

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1           30.     A system for providing automated diagnostic services for a cluster  
2 computer system comprising a plurality of nodes, each of the plurality of nodes  
3 providing a mission-critical application to a plurality of clients, the system  
4 comprising:  
5           a first portion of logic configured to receive a current value of a network  
6 parameter related to cluster middleware associated with the cluster computer system;  
7           a second portion of logic configured to analyze the current value of the  
8 network parameter relative to a predetermined reference value for the network  
9 parameter; and  
10          a third portion of logic configured to provide information based on the analysis  
11 of the current value relative to the predetermined reference value.

1           31.     The system of claim 30, further comprising a computer configured to  
2     store and implement the first, second, and third portions of logic.

1           32.     The system of claim 30, wherein the first, second, and third portions of  
2     logic are embodied in an operating system associated with the computer.

1           33.     The system of claim 30, wherein the first, second, and third portions of  
2     logic are embodied in cluster middleware associated with the computer.

1           34.     The system of claim 30, further comprising a network interface card  
2     configured to communicate with a cluster interface.

1           35.     The system of claim 34, further comprising one or more clients in  
2 communication with the computer via the cluster interface.

1           36.     The system of claim 30, further comprising a network interface  
2 configured to communicate with the cluster computer system via a communications  
3 network and wherein the current value of the network parameter is received via a  
4 communications network and the information based on the analysis is provided to the  
5 cluster computer system via the communications network.

1           37.     The system of claim 30, wherein the network parameter relates to a  
2 network heartbeat interval for a node in the cluster computer system and the  
3 predetermined reference value is an optimal network heartbeat interval for the node  
4 based on the current heartbeat link for the node.

1           38.     The system of claim 37, wherein the second portion of logic is further  
2 configured to determine whether the difference between the current value and the  
3 optimal network heartbeat interval is within a predetermined variance.

1           39.     The system of claim 38, wherein the third portion of logic is further  
2 configured to provide a warning of a potential failover recovery problem if the  
3 difference between the current value and the optimal network heartbeat interval is not  
4 within the predetermined variance.

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1           40.     The system of claim 38, further comprising a fourth portion of logic  
2 configured to determine whether an alternative heartbeat link for the node is available  
3 if the difference between the current value and the optimal network heartbeat interval  
4 is not within the predetermined variance.

1           41.     The system of claim 38, further comprising a fourth portion of logic  
2 configured to repeat the first, second, and third portions of logic for another node in  
3 the cluster computer system if the difference between the current value and the  
4 optimal network heartbeat interval is within the predetermined variance.

1           42.     The system of claim 40, further comprising a fifth portion of logic  
2 configured to provide a warning of a potential failover recovery problem if an  
3 alternative heartbeat link for the node is not available.

1           43.     The system of claim 40, further comprising a fifth portion of logic  
2 configured to determine, if an alternative heartbeat link for the node is available, the  
3 optimal network heartbeat interval for the node based on the alternative heartbeat link  
4 for the node and analyze the current value of the network heartbeat interval relative to  
5 the optimal network heartbeat interval associated with the alternative heartbeat link  
6 for the node.

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1           44.     The system of claim 30, wherein the network parameter relates to a  
2     node timeout value for a node in the cluster computer system and the predetermined  
3     reference value comprises a predefined threshold range for the node timeout value.

1           45.     The system of claim 44, wherein the predefined threshold range for the  
2     node timeout value is based on a function of a network heartbeat interval for the node.

1           46.     The system of claim 45, wherein the third portion of logic is further  
2     configured to determine whether the current value of the node timeout value is within  
3     a predetermined variance.

1           47.     The system of claim 46, wherein the third portion of logic is further  
2     configured to provide a warning that the node timeout value is not within the  
3     predefined threshold range.

1           48.     The system of claim 47, wherein the third portion of logic is further  
2     configured to generate an instruction configured to set the node timeout value within  
3     the predefined threshold range.

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1           49.     The system of claim 47, wherein the predetermined reference value  
2 further comprises a predefined recommended range and wherein the third portion of  
3 logic is further configured to, if the current value of the node timeout value is greater  
4 than the upper bound of the predefined threshold range, provide a warning that the  
5 node timeout value is too high and generate an instruction configured to set the node  
6 timeout value of the node to the upper bound of the predefined threshold range.

1           50.     The system of claim 47, wherein the predetermined reference value  
2 further comprises a predefined recommended range and wherein the third portion of  
3 logic is further configured to, if the current value of the node timeout value is greater  
4 than the upper bound of the predefined recommended range, determine whether an  
5 empirical condition associated with the cluster computer system exists that suggests  
6 the current value of the node timeout value should be greater than the upper bound of  
7 the predefined recommended range.

1           51.     The system of claim 50, further comprising a fourth portion of logic  
2 configured to, if an empirical condition does not exist, provide a warning that the node  
3 timeout value is too high and generate an instruction configured to set the node  
4 timeout value of the node to the upper bound of the predefined threshold range.

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1           52.     The system of claim 47, wherein the predetermined reference value  
2 further comprises a predefined recommended range and wherein the third portion of  
3 logic is further configured to, if the current value of the node timeout value is less than  
4 the lower bound of the predefined recommended range, determine whether an  
5 empirical condition associated with the cluster computer system exists that suggests  
6 the current value of the node timeout value should be less than the upper bound of the  
7 predefined recommended range.

1           53.     The system of claim 52, wherein the third portion of logic is further  
2 configured to, if an empirical condition does not exist, provide a warning that the node  
3 timeout value is too low and generate an instruction configured to set the node timeout  
4 value of the node to the lower bound of the predefined recommended range.

1           54.     The system of claim 47, wherein the predetermined reference value  
2 further comprises a predefined recommended range and wherein the third portion of  
3 logic is further configured to, if the current value of the node timeout value is not less  
4 than the lower bound of the predefined threshold range, provide a warning that the  
5 node timeout value is too low and generate an instruction configured to set the node  
6 timeout value of the node to the lower bound of the predefined threshold range.

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1           55.     The system of claim 30, wherein the network parameter relates to an  
2     autostart timeout interval for a node in the cluster computer system and the  
3     predetermined reference value comprises a predefined range for the autostart timeout  
4     interval.

1           56.     The system of claim 55, wherein the second portion of logic is further  
2     configured to determine whether the current value of the autostart timeout interval is  
3     within the predefined range.

1           57.     The system of claim 56, wherein the third portion of logic is further  
2     configured to, if the current value of the autostart timeout interval is above the upper  
3     bound of the predefined range, provide an instruction configured to decrease the  
4     autostart timeout interval of the node.

1           58.     The system of claim 56, wherein the third portion of logic is further  
2     configured to, if the current value of the autostart timeout interval is below the lower  
3     bound of the predefined range, provide an instruction configured to increase the  
4     autostart timeout interval of the node.

1           59.     The system of claim 56, wherein the second portion of logic is further  
2     configured to determine whether the current value of the autostart timeout interval is  
3     within the predefined range is performed after determining that a cluster unification  
4     process has been initiated during reboot of the node.

1           60.     The system of claim 30, wherein the network parameter relates to a  
2 network polling interval for a node in the cluster computer system and the  
3 predetermined reference value comprises a predefined range for the network polling  
4 interval.

1           61.     The system of claim 60, wherein the second portion of logic is further  
2 configured to determine whether the current value of the network polling interval is  
3 within the predefined range.

1           62.     The system of claim 61, wherein the third portion of logic is further  
2 configured to, if the current value of the network polling interval is above the upper  
3 bound of the predefined range, provide an instruction configured to decrease the  
4 network polling interval of the node.

1           63.     The system of claim 61, wherein the third portion of logic is further  
2 configured to, if the current value of the network polling interval is below the lower  
3 bound of the predefined range, provide an instruction configured to increase the  
4 network polling interval of the node.

1           64.     The system of claim 61, wherein the second portion of logic is further  
2 configured to determine whether the current value of the network polling interval is  
3 within the predefined range is performed after determining that the network polling  
4 has been set.